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Subgradient

- Generalises gradient to convex but non-differentiable problems

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- Examples:

Subgradient

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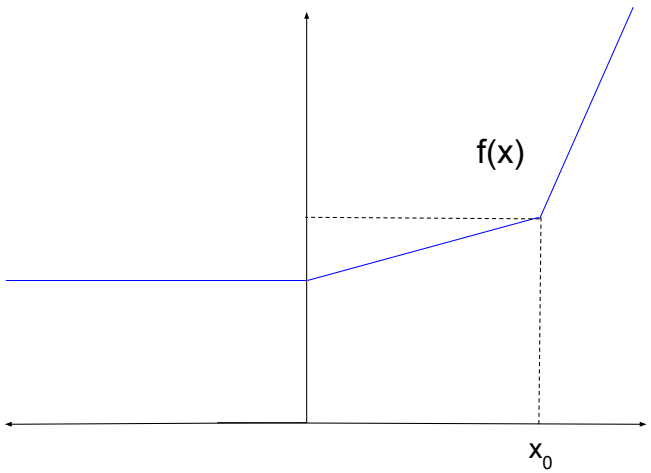
Subgradient

- Generalises gradient to convex but non-differentiable problems
- Examples:
  - $f(x) = |x|$

Task at hand

- TASK: find derivative of $f(x)$ at $x = x_0$



Solution

- Construct a differentiable $g(x)$

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  - Intersecting $f(x)$ at $x = x_0$

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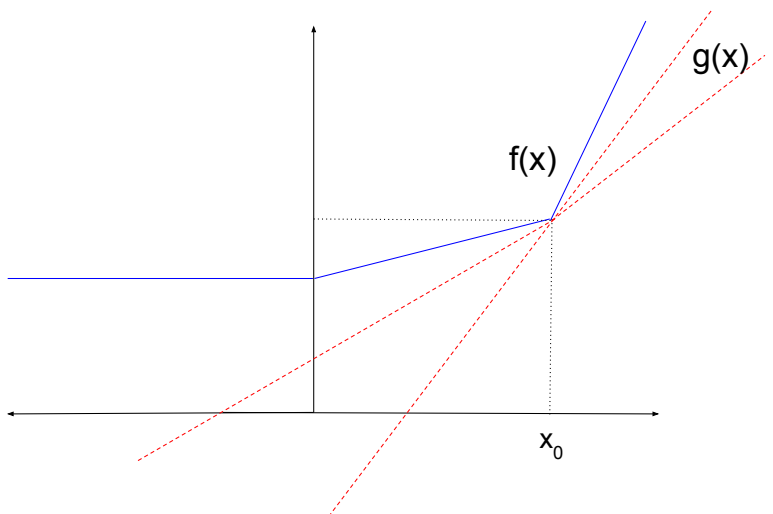
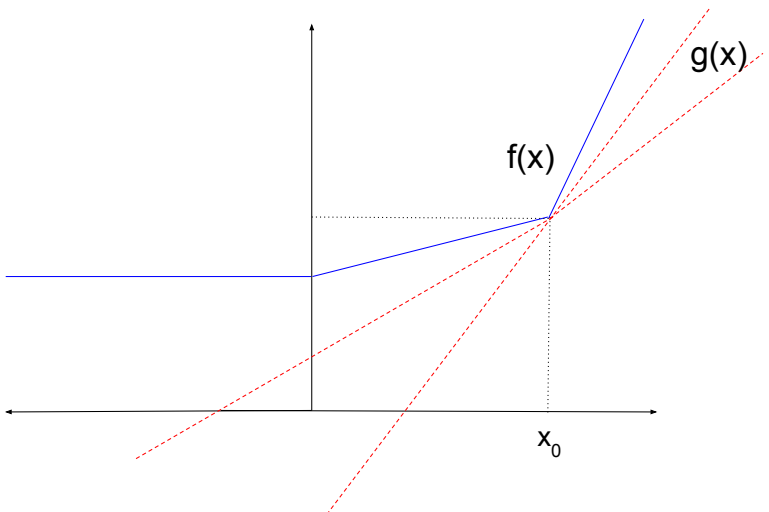
- Construct a differentiable $g(x)$
  - Intersecting $f(x)$ at $x = x_0$
  - Below or on $f(x)$ for all x



Solution

- Compute slope of $g(x)$ at $x = x_0$



Another Example: $f(x) = |x|$

- Subgradient of $f(x)$ belongs to $[-1, 1]$